

P. ENT COOPERATION TREA . .

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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 20 February 2001 (20.02.01)	
International application No. PCT/ZA00/00104	Applicant's or agent's file reference PCT/2000/042
International filing date (day/month/year) 06 June 2000 (06.06.00)	Priority date (day/month/year) 07 June 1999 (07.06.99)
Applicant COETZEE, Gert, Hendrik, Jacobus	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 13 November 2000 (13.11.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Henrik Nyberg
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P2129PC00		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/ZA00/00104	International filing date (day/month/year) 06/06/2000	Priority date (day/month/year) 07/06/1999	
International Patent Classification (IPC) or national classification and IPC C01G25/06			
Applicant UNIVERSITY OF PRETORIA			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 13/11/2000	Date of completion of this report 01.08.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Fortunati, T Telephone No. +49 89 2399 8561 

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

LE ROUX, Marius
D.M. KISCH Inc.
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AFRIQUE DU SUD

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing
(day/month/year) 01.08.2001

Applicant's or agent's file reference
P2129PC00

IMPORTANT NOTIFICATION

International application No.
PCT/ZA00/00104

International filing date (day/month/year)
06/06/2000

Priority date (day/month/year)
07/06/1999

Applicant
UNIVERSITY OF PRETORIA

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/



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Authorized officer

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/ZA00/00104

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-44 as originally filed

Claims, No.:

1-20 with telefax of 11/04/2001

Drawings, sheets:

1/1 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/ZA00/00104

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	1-20
Inventive step (IS)	Yes: Claims	
	No: Claims	1-20
Industrial applicability (IA)	Yes: Claims	1-20
	No: Claims	

2. Citations and explanations
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/ZA00/00104

- 1) Reference is made to the following documents:

D1: WO 86 04614 A (COMMW SCIENT IND RES ORG) 14 August 1986
(1986-08-14)

D2: US 3 672 825 A (GAMBALE JAMES RICHARD ET AL) 27 June 1972
(1972-06-27)

D3: WO 88 03128 A (COMMW SCIENT IND RES ORG) 5 May 1988 (1988-05-05)

D4: RALPH NIELSEN: "Zirconium and Zirconium Compounds" ULLMANN'S
ENCYCLOPEDIA OF INDUSTRIAL CHEMISTRY, vol. a, no. 28, 1996, pages
543-567, XP002146764 Weinheim

- 2) Regarding section VIII:

- 2.1) Claim 1 relates to a process of forming zirconium basic sulphate (ZBS).

Unfortunately, claim 1 does not give sufficient information to understand how one could obtain ZBS for the following reasons:

Claim 1 comprises three steps. The first step provides an alkali-fusion decomposed zircon product (AFDZ) formed from reacting zircon with a source of alkali metal at elevated temperatures. This step is clearly defined and is acceptable. The second step recites: " ... treating the AFDZ to form a solid containing hydrated zirconium oxide and/or hydrated zirconium basic carbonate (hydrated zirconium product) ". The part " **to form a solid containing hydrated zirconium oxide and/or hydrated zirconium basic carbonate (hydrated zirconium product)** " is merely the purpose to be achieved by this second step and does not limit the scope of protection of claim 1. As a consequence, the only useful technical information of this second step remains: " **treating the AFDZ** ". The Examiner is of the opinion that this part (" **treating the AFDZ** ") is vague and unspecific. There are thousands of way according to which the AFDZ from step 1 of claim 1 can be treated. The word " treating " does not give any information how the AFDZ from step 1 of claim 1 reacts in order to provide the desired hydrated zirconium product. The insertion of claim 2 in step 2 of claim 1 would have clarified how AFDZ is treated.

The same applies to the third step of claim 1 reciting that the solid hydrated zirconium product is treated to obtain in situ formation of ZBS as a solid thereon. Once again, the formulation " **to obtain in situ formation of ZBS as a solid** " is

merely the result to be achieved and cannot limit the scope of protection of claim 1. The remaining formulation " **treating the solid hydrated zirconium product** " is unspecific and vague and does not give any information about how ZBS is obtained. The insertion of claim 6 in step 3 of claim 1 would have clarified how ZBS is obtained.

2.2) The same objections apply to claims 7, 14, 17 and 19. Regarding claims 7, 14 and 17 the step according to which the hydrated zirconium product is obtained is sufficiently described and clarified and is acceptable. It is specified therein that the hydrated zirconium product is obtained by leaching the AFDZ from the first step. However, in claims 7, 14 and 17 the step relating to the formation of ZBS is still not clear for the reasons indicated for step 3 of claim 1 of the application (see section 2.1 above) . Regarding claim 19, the step relating to the formation of AZST from AFDZ (2nd step of claim 19) and the step relating to the formation of ZBS (last step of claim 19) are not clear for the reasons already indicated for step 1 and 3 of claim 1 (see section 2.1 above).

2.3) The Applicant has stated that the inventive concept present in each of the process-claims 1, 7, 14, 17 and 19 is based on the following three steps:

- i) providing an AFDZ,
- ii) treating the AFDZ to form a solid hydrated zirconium product
- iii) treating the solid hydrated zirconium product from ii) to form ZBS.

If these three steps i) to iii) are the inventive concept present in each of the process-claims 1, 7, 14, 17 and 19, it is not evident why the Applicant describes this inventive concept in such a vague, unclear, undefined, insufficient and unspecific manner in the claims 1, 7, 14, 17 and 19. The dependent claims 2, 6, 11 provide enough information to better specify and clarify the obscure aspects of claims 1, 7, 14, 17 and 19.

3) Regarding section V:

3.1) Regarding product-claim 20, the Applicant should take into account that a product (a zirconium containing product) is not rendered patentable by the fact that it is produced by means of a patentable process. A product-claim should be defined by means of product-features and not by means of the process to be used to obtain such a product.

CLAIMS

1. A process of forming zirconium basic sulphate (hereinafter referred to as ZBS) comprising:
 - 5 - providing an alkali-fusion decomposed zircon product (hereinafter referred to as AFDZ) formed from reacting zircon with a source of alkali metal at elevated temperatures;
 - treating the AFDZ to form a solid containing hydrated zirconium oxide and/or hydrated zirconium basic carbonate (hereinafter referred to as the hydrated zirconium product);
 - 10 - treating the solid hydrated zirconium product to obtain *in situ* formation of ZBS as a solid thereon.
2. The process of claim 1 wherein the hydrated zirconium product is prepared by forming an acid zirconium sulphate tetrahydrate (hereinafter referred to as AZST) solution from the AFDZ; and thereafter precipitating hydrated zirconium basic carbonate (hereinafter referred to as ZBC) and/or precipitating hydrated zirconium oxide from the AZST solution.

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3. The process of claim 2 wherein the AZST solution is formed by reacting the AFDZ with a source of sulphate to form the AZST in the solid which contained the AFDZ; and then leaching the AZT containing solid to extract the AZST into solution.
- 5
4. The process of claim 2 wherein hydrated ZBC is precipitated from the AZST solution, and which hydrated ZBC is precipitated by adding a carbonate to the AZST solution.
- 10 5. The process of claim 1 wherein the solid hydrated zirconium product is formed by leaching the AFDZ to provide a leachate containing non-zirconium containing products, and a solid residue containing the hydrated zirconium product.
- 15 6. The process of claim 1 wherein the solid hydrated zirconium product is treated by adding a source of sulphate thereto, thereby *in situ* forming solid ZBS thereon.
- 20 7. A process of beneficiating zircon by separating non-zirconium containing products therefrom comprising:
- providing AFDZ formed from reacting zircon with a source of

- alkali metal at elevated temperatures;
- leaching the AFDZ to provide a leachate containing non-zirconium containing products, and a solid residue containing a hydrated zirconium product; and
 - 5 - treating the residue in order to obtain *in situ* formation of ZBS as a solid in the residue.
8. The process of claim 7 which includes the step of forming AFDZ by reacting zircon with a source of alkali metal at elevated temperatures and
- 10 wherein the source of alkali metal comprises a compound selected from the group consisting of NaOH and Na₂CO₃.
9. The process of claim 7 wherein the leaching step comprises leaching the AFDZ with water.
- 15
10. The process of claim 9 wherein the water leached AFDZ is acidified to a pH between 4 and 6 and then leached with water to remove non-zirconium containing products.
- 20 11. The process of claim 7 wherein the ZBS is formed by adding a stoichiometric quantity of a source of sulphate to the leached residue and

heating the mixture.

12. The process of claim 11 wherein the source of sulphate comprises a compound selected from the group consisting of H_2SO_4 and AZST; and the mixture of the leached residue and source of sulphate then being heated at a temperature from 80 to 90°C for at least 10 minutes.

13. The process of claim 7 wherein the ZBS is purified by washing it with acid at elevated temperatures.

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14. A process of producing zircon derived material suitable for pigments comprising:

- providing AFDZ formed from reacting zircon with a source of alkali metal at elevated temperatures;
- 15 - leaching the AFDZ to provide a leachate containing non-zirconium containing products, and a solid residue containing a hydrated zirconium product;
- treating the residue in order to obtain *in situ* formation of ZBS as a solid in the residue;
- 20 - drying the ZBS-containing residue and calcining the dried ZBS-containing residue to form a calcined product which is a zircon

derived material suitable for pigments.

15. The process of claim 14 wherein the ZBS containing residue is purified prior to drying and calcining said residue.
- 5 16. The process of claim 14 wherein the ZBS containing residue is subjected to a size reduction step to reduce the average particle size of the residue so that it is suitable for pigments.
- 10 17. A process of beneficiating zircon to produce opacifier material comprising:
- providing AFDZ formed from reacting zircon with a source of alkali metal at elevated temperatures;
 - leaching the AFDZ to provide a leachate containing non-zirconium containing products, and a solid residue containing a
 - 15 hydrated zirconium product;
 - treating the residue in order to obtain *in situ* formation of ZBS as a solid in the residue;
 - purifying the ZBS containing residue by removing non-zirconium containing species; and
 - 20 - calcining the purified ZBS containing product thereby to produce opacifier material.

18. The process of claim 17 which includes subjecting the opacifier material to a size reduction step, to achieve a d_{50} particle size of less than $1,5\mu\text{m}$.
- 5 19. A process of beneficiating zircon by separating non-zirconium containing products therefrom comprising:
- providing AFDZ formed from reacting zircon with a source alkali metal at elevated temperatures;
 - treating the AFDZ to form a solution containing AZST;
 - 10 - precipitating hydrated ZBC or hydrated zirconium oxide and soluble sulphates from the AZST solution;
 - washing the precipitate to remove soluble sulphates;
 - treating the washed precipitate in order to obtain *in situ* formation of ZBS thereon.
- 15 20. A zirconium containing product prepared by the process of any one of the preceding claims.
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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PCT/2000/042	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/ZA 00/ 00104	International filing date (day/month/year) 06/06/2000	(Earliest) Priority Date (day/month/year) 07/06/1999
Applicant UNIVERSITY OF PRETORIA		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1
☐ None of the figures.

INTERNATIONAL SEARCH REPORT

Inter Application No

PCT/ZA 00/00104

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C01G25/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C01G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 86 04614 A (COMMW SCIENT IND RES ORG) 14 August 1986 (1986-08-14) page 2, line 4 - line 18	1-20
A	US 3 672 825 A (GAMBALE JAMES RICHARD ET AL) 27 June 1972 (1972-06-27) column 2, line 35 - line 60; figure 1	1-20
A	WO 88 03128 A (COMMW SCIENT IND RES ORG) 5 May 1988 (1988-05-05) claim 18	1-20
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☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

6 September 2000

Date of mailing of the international search report

19/09/2000

Name and mailing address of the ISA

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Authorized officer

Siebel, E

INTERNATIONAL SEARCH REPORT

Inter Application No

PCT/ZA 00/00104

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>RALPH NIELSEN: "Zirconium and Zirconium Compounds" ULLMANN'S ENCYCLOPEDIA OF INDUSTRIAL CHEMISTRY, vol. a, no. 28, 1996, pages 543-567, XP002146764 Weinheim page 560, paragraph 2.9. -page 561, paragraph 2.10</p> <p>-----</p>	1-20

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter

Application No

PCT/ZA 00/00104

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 8604614	A	14-08-1986	AU 586467 B	13-07-1989
			AU 5397286 A	26-08-1986
			EP 0210236 A	04-02-1987
			JP 62501555 T	25-06-1987
			US 4746497 A	24-05-1988
US 3672825	A	27-06-1972	NONE	
WO 8803128	A	05-05-1988	AT 83471 T	15-01-1993
			AU 591361 B	30-11-1989
			AU 8109187 A	25-05-1988
			DE 3783132 A	28-01-1993
			DK 552387 A	29-04-1988
			EP 0289537 A	09-11-1988
			ES 2008758 A	01-08-1989
			JP 1501061 T	13-04-1989
			ZA 8707543 A	28-12-1988